

## **A comparison of the performance of the UK EQ-5D-3L and EQ-5D-5L using evidence from the GP Patient Survey**

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### **Abstract**

There are two versions of EQ-5D, a brief preference-based utility measure that can be used in economic evaluation, one with 3 severity levels (3L) and one with 5 levels (5L). In England, EQ-5D-3L can be scored using the existing United Kingdom preference-based tariff while the EQ-5D-5L can be scored using a crosswalk to the 3L tariff or using the new English tariff. This study compared the performance of the EQ-5D-3L (n=930,200) against the EQ-5D-5L (n=881,810) using evidence from the GP Patient Survey (GPPS) in England. Comparison was based on feasibility (missing data) distribution across the dimensions, ceiling and floor effects, and discriminative properties using Shannon's indices. Utility scores for the two versions were compared in terms of absolute and standardized effect sizes for groups with known differences categorised by self-reported long-term health condition, limitations in activity, and sociodemographic factors for the full samples. In addition, matched samples (age, gender and comorbidities) were used to compare utilities for subgroups with long-term health conditions.

While the 3L and 5L had similar levels of missing data across dimensions, there was evidence of improved performance in the 5L compared to the 3L in terms of reduced ceiling effects (34.9%<sub>5L</sub> vs. 44.4%<sub>3L</sub>) and re-distribution across the other levels, particularly for mobility, usual activities and pain/discomfort dimensions. There were very few respondents reporting the lowest level in either version (0.02%<sub>5L</sub> vs. 0.03%<sub>3L</sub>). Mean (SD; range) 3L utility values were 0.804 (0.265; -0.594 to 1), mean 5L values from the cross-walk were 0.796 (0.237; -0.594 to 1) and mean utility values for the 5L were 0.859 (0.205; -0.281 to 1).

The 5L utility values tended to be higher than corresponding 3L values but the variance in the 3L scores was larger (e.g. males means 0.860<sub>5L</sub> vs 0.808<sub>3L</sub>; standard deviations 0.205<sub>5L</sub> vs 0.261<sub>3L</sub>). Cross-walk values were smaller or equivalent to 3L values and smaller than 5L values (males, mean(SD): 0.799 (0.236). All versions were able to discriminate in the expected direction between groups with known differences e.g. younger respondents had higher utility scores than older respondents. The 3L had larger absolute mean differences between most groups with known differences but this was mediated by the larger variances thus standardised effect sizes across the three versions were comparable. For example, comparing those with arthritis/joint problems to those without, absolute differences were 0.311<sub>3L</sub> vs. 0.273<sub>cw</sub> vs. -0.232<sub>5L</sub> and effect sizes were 1.15<sub>3L</sub> vs. 1.13<sub>cw</sub> and -1.10<sub>5L</sub>. Differences between those with and without a condition were smaller in the matched samples with small and similar differences across the three versions for some conditions (angina/heart problems, asthma/chest problems, cancer, blind/visual problems, deaf/hearing problems, diabetes, epilepsy, kidney/liver problems, learning difficulties). This study adds to what is known in terms of comparison based on utility values using the latest English tariff for the 5L.

**Word count: 3,760**

## 1. Background

The quality adjusted life year (QALY) is a metric which is obtained by adding up units of time multiplied with values reflecting the quality of life during that time. These values typically range from 1 (full health) to 0 (dead) with negative values assigned to health states considered worse than dead. The values aim to reflect preferences for different health states and may be derived directly, using preference-based techniques such as time trade-off, or indirectly, using preference-based measures (PBMs). All PBMs have a descriptive system that describes the health status of patients across different health dimensions. Some PBMs also have a preference-based utility tariff that can be used to generate the values used in calculating the QALY. Several generic PBMs are available and the most widely used measure is the EQ-5D [1].

The EQ-5D has a descriptive system with 5 dimensions (mobility, self-care, usual activities, pain/discomfort and anxiety/depression) [2]. The original version has 3 severity levels for each dimension describing 243 health states and in the UK this was valued using time trade off. This resulted in a value-function with values ranging from -0.594 to 1 [3]. A recent review of reviews showed that the EQ-5D-3L is valid for a wide number of conditions [4]. However, there has been continued concern that the 3 levels result in poorer discrimination for milder conditions with a large proportion reporting no problems in all dimensions (ceiling effects). There are also concerns with discriminating across those with “some problems”. The EQ-5D-5L was developed in 2011 to address these concerns [5]. The EQ-5D-5L has the same dimensions as the 3L but has 5 severity levels (no, slight, moderate, severe, extreme/unable problems) describing 3125 health states. There were also changes to the mobility dimension wording for the most severe level from ‘confined to bed’ in the 3L to ‘unable to walk about’ in the 5L. Several studies assessing the performance of the 5L descriptive system [6-17] have shown that there is a reduction in ceiling effects and an improvement in the absolute discriminative performance of the 5L compared to the 3L.

This study aims to add to the existing literature about the performance of the 3L and the 5L. Within this it is rather unique that it is based on more than 1.8 million observations and additionally, it is carried out at a time that new value sets are available for the 5-level version allowing for an additional angle in the comparison [18]. More specifically, an English valuation study for the 5L has been undertaken using time trade off and discrete choice experiments resulting in utility values ranging from -0.281 to 1 [19]. And where previous studies comparing the 3L and 5L have generally focused on single condition populations or mixed populations drawn from various studies and countries, this study aimed to assess the performance of the 5L relative to the 3L using data collected by a large survey of the general population in England.

## 2. Methods

### 2.1 Data

The individual patient level data used in the analysis was from the General Practitioners' Patient Survey (GPPS) (2011 to 2013) [20]. This is a cross-sectional bi-annual survey undertaken independently for National Health Service (NHS) England to assess patients' experience of using their GP practice and other NHS services. The survey is sent out as a postal questionnaire in January and July to over 1 million adult patients in each wave. A reminder is sent to non-responders up to 2 months after the original questionnaire. Patients can complete the survey on paper, online or by telephone. There are also options to complete it in 13 languages other than English, or British Sign Language. Patient samples are obtained (proportionately stratified) for each GP practice using registration records held by the Health and Social Care Information Centre database [20]. The final data has survey weights to take into account differences between all patients at a practice and patients who complete the questionnaire.

### 2.2 Measures

While the GPPS questions focus mainly on GP and other NHS service experience, respondents also complete the EQ-5D, with the 3L completed in 2011 to 2012 and the 5L completed since then. In this study, data from 2012 to 2013 are used. The EQ-5D-3L was scored with the old UK tariff [3] while the EQ-5D-5L was scored using both the cross-walk [18] and the new English tariff (range -0.281 to 1) [19]. The choice to also include the cross-walk value function (excluding weak inconsistencies) is because the range of values is identical to the range of the 3L study (in both cases from -0.594 to 1).

Within the GPPS, respondents also provide details on long-term conditions (Alzheimer's disease/ dementia, angina/heart problem, arthritis/joint problem, asthma/chest problem, blindness, cancer, deafness, diabetes, epilepsy, high blood pressure, kidney or liver disease, learning difficulty, back problem, mental health problem, neurological problem). They provide data about activity limitation due to recent illness or injury, age, gender, ethnicity, employment status, and whether individuals are carers. Also available is the index of multiple deprivation (IMD), the official measure of relative deprivation for small areas based on income, employment, health, crime, housing and living environment [21]. The IMD variables are provided as either a continuous number or categorised into bands (least, moderately and most deprived). The latter was used in our analyses.

### 2.3 Data analysis

#### 2.3.1 Comparing the EQ-5D-5L to the EQ-5D-3L

The number of missing values across the two versions in each dimension was used as a measure of the feasibility. The distribution across the dimension levels was assessed for the whole sample and for each long-term condition. The proportion of respondents who report no problems in all 5 dimensions in both the

3L and the 5L were compared over the whole sample, separately for each long-term condition, and for activity limitation due to recent illness or injury. It was expected that the 5L would have a lower proportion scoring no problem in all dimensions (i.e. a ceiling effect) than the 3L as well as a lower proportion scoring the lowest levels across all the dimensions. The distributions of the most prevalent health states were also compared.

The Shannon index (H) and the Shannon Evenness (E) index were used to assess absolute and relative discriminatory power of the 3L and 5L separately for each dimension across the full sample and by long-term condition[11;22]. Larger Shannon's indices indicate better discriminatory power and one would expect the 5L to perform better than the 3L.

Utility scores for the three versions (3L, cross-walk and 5L) were compared based on socio-demographic factors such as age, gender, employment status, IMD scores, activity limitation, presence of long-term condition, and whether or not individuals were carers. The same variables were used to assess absolute differences as well as standardised effect sizes (absolute difference divided by the pooled standard deviation) between groups with known differences. Ranking of conditions/limitations based on 3L, cross-walk and 5L values was undertaken.

Secondary analysis - replicating the analyses described above - were undertaken comparing utility values from matched sub-groups. Individuals from the 3L and 5L samples were matched based on age, gender, presence of long-term conditions and comorbidities as these variables are known to have an effect on utility scores and thus may contribute to any differences observed in the full sample. Matching was based on one-to-one match identifying individuals with or without the condition and comorbidities of the same age, gender and whether they had completed the 3L or 5L.

### *2.3.2 Seasonal variation and survey weights*

Due to expected seasonal variations at the time of data collection (January – winter vs. July – summer) NHS England recommend that the analysis is undertaken separately for the two waves. However, this advice is typically in relation to assessing performance at practice, region or national level where reflecting seasonal variations may be important. In the context of comparing the 3L and 5L, as average differences are more relevant, the January and July data was collated. The GPPS data has survey weights to account for non-response at practice level based on factors such as age and gender. The weights are important when the data is used to provide information about population level estimates. As this is not an important outcome when comparing the 3L and 5L, the weights were not utilised in our analyses.

### 2.3.3 Dealing with missing data

Respondents in the survey could have missing responses for any of the variables used in the analyses. With the exception of feasibility analysis, only those with non-missing responses for EQ-5D were included in the analysis. The secondary analysis based on matched samples also only used those with non-missing responses for age, gender and long-term condition. An assessment of differences between those with and without valid EQ-5D responses was undertaken based on age, gender and other characteristics.

All the analysis was undertaken using Stata 14.2 [23].

## 3 Results

### 3.1 Data

A total of 1,037,946 respondents had valid 3L scores (July 2011 n=530,174; Jan 2012 n=507,772) and 971,232 respondents had valid 5L scores (July 2012 n= 475,227; January 2013 n = 496,005). An additional 9.4% (n= 107746/1145692) and 8.4% (n=971232/1060654) of respondents had missing 3L or 5L responses respectively. Those with missing EQ-5D responses were more likely to be older, female, retired, have at least one long-term condition or have a high IMD score compared to those who did not.

### 3.2 Descriptive statistics

The proportions across age, gender, ethnicity, employment status, deprivation and presence of individual long-term conditions were similar across the 3L and 5L samples (Table 1). The majority were female, white British and reported having at least one long-term health condition (60%<sub>3L</sub> , 61%<sub>5L</sub>) with high blood pressure having the largest proportion (22%<sub>3L</sub> , 23%<sub>5L</sub>) (Table 1).

### 3.3 Comparison of distribution across 3L and 5L health dimensions

With the exception of the dimension anxiety / depression (3L = 6.6%, 5L = 5.9%) the proportions with missing responses for the individual dimensions were similar, ranging from 4.2% to 4.9% (Appendix Table 1).

Comparing across levels on the individual dimensions, the 5L had a lower proportion at level 1 compared to the 3L with the largest difference occurring in the pain/discomfort dimension (difference of 8.5%). The smallest difference was in the self-care dimension (2.4%) (Figure 1, Appendix Table 1). This result was replicated when comparing individual dimension level responses by long-term condition sub-groups (Appendix Table 2). As one might expect, the 5L had lower proportions at the most severe level (level 5) than the 3L (level 3) for usual activities, pain/discomfort and anxiety/depression. However, there were no differences for self-care. The 3L had a lower proportion in the most severe level for mobility compared to

the 5L which is probably related to the difference in wording. These findings were replicated when assessing distribution by conditions but here, the 5L tended to also have lower proportions than the 3L in the most severe level of the self-care dimension (Appendix Table 2). There was also evidence of further re-distribution across the levels. For example in the 3L mobility dimensions, for the first three conditions (Alzheimer's/dementia, angina/heart problems and arthritis/joint problems), the majority of the respondents reported level 2 (64%, 59% and 69% respectively) while in the 5L respondents were distributed evenly across levels 2 to 4. This pattern was observed for most dimensions and conditions. Exceptions included self-care and anxiety/depression for non-mental health conditions where the majority of respondents remained at level 1 in both the 3L and 5L.

As expected, the 5L had less respondents at 11111, (5L: 34.9% vs. 3L: 44.4%) in the overall sample (Table 2). Similar results were observed within subgroups defined by long-term conditions (see Appendix Table 3). The differences in these proportions ranged between 2% for arthritis/joint problems to 7.7% for high blood pressure. Overall, very few respondents reported being at the lowest level in all dimensions for either the 3L (0.03%) or the 5L (0.02%) with little difference between the two versions. When assessing the 50 most prevalent health states for each measure, these covered 98% of the 3L respondents and 83% of the 5L respondents<sup>1</sup> (Table 2). In the 5L, there were no respondents in 661 out of the possible 3125 (21.2%) health states while in the 3L there were no respondents in 8 out of the possible 243 (3.3%).

Absolute discriminatory power (Shannon index, H) showed a gain in information richness by using the 5L for all dimensions when assessed by presence of long term condition with overall mean values (3L/5L): mobility (0.72/1.38); self-care (0.67/1.03); usual activities (0.93/1.44); pain/discomfort (0.93/1.43); anxiety/depression (0.84/1.24). Relative discriminatory power (Shannon Evenness index, E) also improved slightly for dimensions across the conditions with mean values (3L/5L): mobility (0.61/0.86); self-care (0.57/0.64); usual activities (0.79/0.89); pain/discomfort (0.80/0.89); anxiety/depression (0.72/0.77). Shannon's indices by condition for the dimensions are reported in Appendix Table 4.

### 3.4 Comparison across 3L and 5L utility scores

Mean (SD; range) 3L utility values were 0.804 (0.265; -0.594 to 1), 5L values from the cross-walk were 0.796 (0.237; -0.594 to 1) while the England tariff values were 0.859 (0.205; -0.281 to 1). Mean utility values were as expected for sub-groups with known differences. For example, 3L, cross-walk and 5L utility scores were negatively associated with age, with younger respondents having higher utility scores in all versions (Table 3); those who were employed had higher utility scores than those who were not employed, and deprivation was associated with lower utility scores. Although there were no differences in mean utility values when

<sup>1</sup> Although there are common health states ranked first across both versions e.g. 11121 and 11112, these represent different health states as a level 2 is 'some' in the 3L and 'slight' in the 5L

comparing respondents who were carers and those who were not, those who provided care more for more hours had lower utility values (Table 3). The presence of a long-term health condition was also associated with lower utility scores (Table 4).

Although both the 3L and 5L displayed similar patterns in discriminating between groups with known differences, the 5L utility scores tended to be larger than 3L values e.g. males means  $0.860_{5L}$  vs  $0.808_{3L}$  but the standard deviations for the 3L were larger e.g. males standard deviations  $0.205_{5L}$  vs  $0.261_{3L}$  (Table 3). This pattern was replicated for all the socio-demographic groups and a similar pattern was observed for those with long-term health conditions (Table 4). For example, mean (SD) for those with Alzheimer's/dementia was  $0.459$  ( $0.368$ ) in the 3L compared to  $0.541$  ( $0.312$ ) in the 5L. Cross-walk values tended to be smaller than the 5L values and smaller or equivalent to 3L values while standard deviations were smaller than the 3L and larger than the 5L (Tables 3 and 4). Ranking across the conditions/limitations based on values from the three versions was similar for most of the conditions with switching occurring within one or two places across the versions (Table 4).

The absolute difference in mean utility scores between those with a long-term health condition compared to those without a condition was larger for the 3L compared to the 5L for all the conditions while cross-walk values were in between (Table 4). However, due to the larger variation in utility scores for the 3L, the standardised differences tended to be similar to 5L and cross-walk values. For example, for angina/heart disease, the effect size for the 3L was  $-0.69$ , for cross-walk was  $-0.71$  while for the 5L English tariff it was  $-0.72$ . Standardised effect sizes were also similar across the three values when comparisons were based on employment status, the number of hours spent caring and deprivation levels.

Comparison of EQ-5D utilities scores for those with a condition against those without the condition fails to take into account the age, gender and comorbidities of those who have the condition which is why matching was conducted. As one might expect, the differences in utility scores for those with and without a condition were smaller in the matched samples, as matching increases the age in the groups without diseases and as such lowers their mean utility scores (Table 5). For some conditions, there were small and similar differences for those with and without the condition for the 3L, cross-walk and the 5L including angina/heart problems, asthma/chest problems, blind/visual problems, cancer, deaf/hearing problems, diabetes, epilepsy, kidney/liver problems and other long-term conditions. For the other conditions, absolute differences were larger in the 3L than the cross-walk and 5L but due to associated large standard deviations, the standardised effect sizes were of a similar magnitude across the three versions. The exception was Alzheimer's/dementia where both the absolute difference and effect size was larger for the 5L and the cross-walk compared to the 3L. Note that those with high blood pressure had higher utility scores than those without for all three versions.

## 4 Discussion

### 4.1 Findings

The aim of this study was to assess the performance of the 5L in comparison to the 3L in terms of feasibility, distribution across the dimension levels including ceiling effects, discriminatory power and known group validity based on utility scores using a large dataset. The 3L and 5L performed in a similar way in terms of feasibility, with similar levels of missing data across dimensions.

As expected, the 3L had higher ceiling effects than the 5L both in the overall sample as well as by condition. This mirrors findings in other studies [11;13;17]. This supported expectations that inclusion of 'slight problems' in the 5L would reduce some of the ceiling effects observed in the 3L. There was also evidence of redistribution across levels 2 to 4 in the 5L for respondents who may have been a level 2 in the 3L. This was particularly the case for mobility, usual activities and pain/discomfort where majority of the respondents with a condition were likely to be a level 2 in the 3L. There was also redistribution of respondents in level 2 for self-care and anxiety/depression (to a lesser degree for non-mental health related conditions) but majority of respondents said they had no problems in these dimensions and this did not change between the 3L and 5L versions.

Fewer respondents reported being at the lowest level in the 5L compared to the 3L in all dimensions by condition with the exception of mobility. The lowest level in mobility in the 3L is 'confined to bed' compared to 'unable to walk about' in the 5L which may explain the discrepancy for this dimension as there are likely to be less people responding that they are confined to a bed than those unable to walk about.

The 5L dimensions had higher absolute discriminative power as well as relative discriminatory power compared to the 3L which again mirrors previous findings. As would be expected, the larger choice of health states for the 5L meant that more health states were used compared to the 3L. There was evidence that the milder health states were more likely to be used in both versions which adds to the evidence that the inclusion on an additional level between 'no problems' and 'moderate problems' helps discriminate for these milder states.

Overall, 5L utility scores were higher than 3L scores while the standard deviation for the 3L was larger which has also been found in other studies [24;25]. This is not unexpected given the smaller range in the 5L English values (-0.281 to 1) compared to the 3L (-0.594 to 1). Cross-walk values tended to be smaller than or equivalent to 3L values and smaller than 5L values. All versions were able to discriminate between groups with known differences such as socio-demographic characteristics or the presence of a long-term health condition. The absolute differences between those with a known group difference and those without were larger in the 3L than the cross-walk and 5L but the standardised differences tended to be the same as 3L had larger variation. Utility weights for being in level 2 or 3 in the 5L English tariff are generally smaller (<0.08 for all dimensions apart from level 3 in anxiety depression = 0.104) than being in level 2 of



the 3L which would all be associated with a weight of 0.081 (constant term) before the relevant utility weight for the level was applied (range 0.036 to 0.123). Redistribution from a level 1 or 2 in the 3L to a 2 or 3 in the 5L may therefore not be associated with large utility changes.

Matching generally resulted in smaller differences between those with and without a condition the three versions compared to the unmatched comparisons. The absolute differences were small and very similar for the 3L, cross-walk and 5L for a number of conditions (angina/heart problems, asthma/chest problems, cancer, blind/visual problems, deaf/hearing problems, diabetes, epilepsy, kidney/liver problems and learning difficulties). The small differences may be due to the nature of the conditions which are more likely to be stable or episodic in nature meaning that compared to a matched sample, there may be little difference in utility values. In the matched comparison, 3L values still had larger absolute differences than the 5L for all the other conditions with the exception of Alzheimer's/dementia where cross-walk and 5L had larger absolute and standardised differences which suggests that changes are due to the descriptive system. For high blood pressure, the differences were positive.

#### **4.2 Limitations**

Although this study has the advantage of two very large population datasets that have been collected using the same methods, there are a number of limitations. 3L and 5L data came from different respondents which may have introduced differences. However, both samples were collected using the same methodology in similar populations and initial descriptive analysis showed similarities between the samples. Matching also helped to address this problem to some extent. The conditions in the study were self-reported which may not be as accurate as diagnosis data. Finally, these data are all cross-sectional which means responsiveness cannot be tested.

#### **4.3 Conclusion**

Despite these limitations, this study provides strong additional evidence on what is known about the performance of the 3L compared to the 5L in terms of improving performance. There was evidence of improved performance in the 5L compared to the 3L based on reduction of ceiling effects and redistribution across the other levels particularly for mobility, usual activities and pain/discomfort dimensions. There was also evidence of improved discriminatory power. The 3L, cross-walk and 5L values were able to discriminate between groups with known differences. However, although the 3L had larger differences, it also had larger variations which meant standardised effect sizes were the same across the versions. This study adds to what is known in terms of comparison based on utility values using the latest English tariff for the 5L.

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Table 1: Descriptive statistics 3L and 5L sample

	3L sample N	3L sample %	5L sample N	5L sample %
Male	398,790	42.9	379,672	43.1
Female	517,978	55.7	492,680	55.9
Missing	13,432	1.4	9,458	1.1
Age				
18 to 24	43,153	4.6	37,594	4.3
25 to 34	96,873	10.4	87,185	9.9
35 to 44	130,543	14	117,141	13.3
45 to 54	164,192	17.7	154,477	17.5
55 to 64	187,972	20.2	177,218	20.1
65 to 74	164,942	17.7	170,296	19.3
75 to 84	97,945	10.5	98,328	11.2
85 or over	31,001	3.3	30,287	3.4
Missing	13,579	1.5	9,284	1.1
English / Welsh / Scottish / Northern Irish / British	760,155	81.7	719,075	81.5
Irish	9,640	1	9,001	1
Gypsy or Irish Traveller	241	0	214	0
Any other White background	39,107	4.2	39,177	4.4
White and Black Caribbean	1,931	0.2	1,805	0.2
White and Black African	1,068	0.1	1,024	0.1
White and Asian	1,839	0.2	1,661	0.2
Any other Mixed / multiple ethnic background	1,973	0.2	1,828	0.2
Indian	22,564	2.4	21,072	2.4
Pakistani	11,773	1.3	11,425	1.3
Bangladeshi	3,884	0.4	3,642	0.4
Chinese	4,882	0.5	4,472	0.5
Any other Asian background	11,758	1.3	10,861	1.2
African	11,953	1.3	11,661	1.3
Caribbean	7,949	0.9	7,630	0.9
Any other Black / African / Caribbean background	3,467	0.4	3,374	0.4
Arab	1,768	0.2	1,510	0.2
Any other ethnic group	19,228	2.1	20,609	2.3
Missing	15,020	1.6	11,769	1.3
Full-time paid work	316,479	34	293,177	33.2
Part-time paid work <30hrs	120,617	13	114,655	13
Full-time education	15,883	1.7	13,810	1.6
Unemployed	38,529	4.1	36,772	4.2
Permanently sick or disabled	40,971	4.4	37,874	4.3
Fully retired from work	280,064	30.1	278,509	31.6
Looking after the home	53,487	5.8	49,049	5.6
Doing something else	19,469	2.1	19,456	2.2
Missing	44,701	4.8	38,508	4.4
Most deprived	301,108	32.4	289,699	32.9
Moderately deprived	318,191	34.2	301,369	34.2
Least deprived	310,266	33.4	290,099	32.9
Missing	635	0.1	643	0.1
Long-standing health condition				
Yes	553,148	59.5	534,376	60.6
No	349,814	37.6	322,702	36.6

	3L sample N	3L sample %	5L sample N	5L sample %
Don't know / can't say	17,132	1.8	16,562	1.9
Missing	10,106	1.1	8,170	0.9
Alzheimer/ Dementia	5,770	0.6	5,259	0.6
Angina /Heart problems	58,906	6.3	56,443	6.4
Arthritis/ Joint problems	145,288	15.6	141,521	16.0
Asthma/ Chest problems	91,373	9.8	88,463	10.0
Blind /Visual problems	11,028	1.2	10,110	1.1
Cancer 5yrs	33,654	3.6	33,904	3.8
Deaf/ Hearing problems	42,373	4.6	41,015	4.7
Diabetes	75,373	8.1	75,681	8.6
Epilepsy	9,369	1.0	8,260	0.9
High blood pressure	207,700	22.3	204,550	23.2
Kidney or Liver problems	15,521	1.7	15,444	1.8
Learning difficulties	6,928	0.7	6,487	0.7
Long-term back problems	95,308	10.2	91,384	10.4
Long-term mental health	30,986	3.3	30,989	3.5
Long-term neurological problems	16,224	1.7	16,214	1.8
Long-term other health problems	107,874	11.6	108,303	12.3
Missing	83,403	9.0	77,822	8.8
Has a comorbidity (more than 1 LTC)	247,923	26.7	246,214	27.9
Activities limited today due to recent illness or injury				
Yes, limited a lot	39,893	4.3	42,585	4.8
Yes, limited a little	130,205	14.0	122,602	13.9
No	741,198	79.7	699,177	79.3
Missing	18,904	2.0	17,446	2.0
Total	930,200	100	881,810	100

Table 2: Fifty 3L and 5L health states ranked by frequency

3L health state	N	Cumulative %	5L health state	N	Cumulative %
1 1 1 1 1	368796	44.4	1 1 1 1 1	276630	34.9
1 1 1 2 1	108276	57.5	1 1 1 2 1	96302	47.1
1 1 1 1 2	49992	63.5	1 1 1 1 2	40877	52.2
2 1 2 2 1	46990	69.2	1 1 1 2 2	32197	56.3
1 1 1 2 2	34458	73.3	2 1 2 2 1	19170	58.7
2 1 2 2 2	26018	76.5	2 1 1 2 1	18303	61.0
2 1 1 2 1	25028	79.5	1 1 1 3 1	15141	62.9
1 1 2 2 1	21233	82.1	1 1 2 2 1	13688	64.6
2 2 2 2 2	14569	83.8	1 1 1 1 3	11881	66.1
2 2 2 2 1	12068	85.3	2 1 2 3 1	9111	67.3
1 1 2 2 2	11981	86.7	2 1 2 2 2	8806	68.4
2 2 2 3 2	10150	87.9	1 1 2 2 2	7118	69.3
2 1 1 2 2	7330	88.8	1 1 1 2 3	7045	70.2
2 1 2 3 1	6004	89.5	3 1 3 3 1	6673	71.0
2 1 2 3 2	5552	90.2	1 1 1 3 2	5517	71.7
2 1 1 1 1	5506	90.9	2 1 1 2 2	5378	72.4
2 2 2 3 1	4796	91.4	3 1 2 3 1	5187	73.1
1 1 2 1 1	4728	92.0	2 1 2 3 2	5155	73.7
2 2 3 3 2	4442	92.6	2 1 1 3 1	4548	74.3
2 1 2 1 1	4143	93.1	1 1 2 3 1	4364	74.8
1 1 2 1 2	4008	93.5	2 1 1 1 1	4101	75.3
2 2 3 2 2	3395	93.9	3 1 3 3 2	3684	75.8
2 2 2 3 3	2929	94.3	3 1 2 2 1	3448	76.2
1 1 1 1 3	2201	94.6	1 1 2 1 1	3248	76.7
2 1 2 2 3	2184	94.8	1 1 1 3 3	2640	77.0
2 2 3 2 1	2121	95.1	1 1 2 3 2	2630	77.3
2 2 2 2 3	2116	95.3	3 1 2 3 2	2455	77.6
2 2 3 3 3	2016	95.6	3 2 3 3 2	2210	77.9
2 2 3 3 1	1573	95.8	1 1 2 2 3	2190	78.2
1 1 2 2 3	1531	96.0	2 1 2 1 1	2166	78.5
2 1 2 1 2	1492	96.1	3 1 3 3 3	2149	78.7
1 1 2 1 3	1458	96.3	2 1 2 2 3	2124	79.0
1 1 1 2 3	1442	96.5	3 2 3 3 1	2122	79.3
2 1 3 2 1	1379	96.6	2 1 2 3 3	2079	79.5
2 1 3 2 2	1203	96.8	3 1 1 3 1	2066	79.8
2 2 2 1 1	1112	96.9	4 3 4 4 3	1998	80.0
2 1 2 3 3	1107	97.1	1 1 2 1 2	1922	80.3
1 1 1 3 1	1054	97.2	2 1 3 3 1	1913	80.5
2 1 1 1 2	997	97.3	3 3 3 3 3	1865	80.8
2 3 3 2 2	946	97.4	3 1 1 2 1	1731	81.0
2 1 1 3 1	826	97.5	3 1 3 2 1	1688	81.2
1 1 2 3 2	806	97.6	2 2 2 2 1	1643	81.4
2 1 3 3 2	789	97.7	3 3 3 3 2	1640	81.6
1 1 2 3 1	776	97.8	2 1 1 3 2	1617	81.8
1 2 2 2 2	768	97.9	3 3 3 3 1	1520	82.0
2 2 2 1 2	703	98.0	2 2 2 2 2	1495	82.2
2 3 3 3 2	698	98.1	3 1 2 2 2	1482	82.4
1 2 2 2 1	686	98.2	2 1 3 3 2	1449	82.6
2 2 3 2 3	663	98.2	1 1 1 1 4	1428	82.7
2 1 3 3 1	580	98.3	3 2 3 3 3	1423	82.9

3L: level 2 'some problems' level 3 'unable/extreme'

5L: level 2 'slight problems' level 3 'moderate' level 4 'severe' level 5 'unable/extreme'

Table 3: EQ-5D scores by socio-demographic characteristics

		EQ-5D-3L				EQ-5D-5L (cross walk)				EQ-5D-5L		
		N	Mean	SD	ES	N	Mean	SD	ES	Mean	SD	ES
Gender	Male	398,790	0.808	0.261		379,672	0.799	0.236		0.860	0.205	
	Female	517,978	0.802	0.266		492,680	0.796	0.237		0.859	0.204	
Age	18 to 24	43,153	0.91	0.177		37,594	0.898	0.169		0.936	0.124	
	25 to 34	96,873	0.902	0.187		87,185	0.891	0.174		0.931	0.132	
	35 to 44	130,543	0.87	0.223		117,141	0.862	0.202		0.91	0.163	
	45 to 54	164,192	0.825	0.26		154,477	0.82	0.231		0.878	0.197	
	55 to 64	187,972	0.79	0.275		177,218	0.786	0.241		0.852	0.214	
	65 to 74	164,942	0.766	0.269		170,296	0.765	0.233		0.837	0.21	
	75 to 84	97,945	0.701	0.281		98,328	0.702	0.247		0.784	0.226	
	85 or over	31,001	0.589	0.306		30,287	0.582	0.285		0.676	0.261	
Employed	No	448,403	0.727	0.305		435,470	0.726	0.271		0.800	0.244	
	Yes	437,096	0.894	0.163	0.64	407,832	0.881	0.147	0.67	0.930	0.105	0.65
Carer	No	700,268	0.813	0.263		661,897	0.805	0.238		0.865	0.205	
	Yes	178,971	0.802	0.242	-0.04	172,501	0.794	0.207	-0.05	0.863	0.177	-0.01
Look after/provide support to family etc. for physical or mental ill health	No	700,268	0.813	0.263		661,897	0.805	0.238		0.865	0.205	
	1-9 hours a week	100,463	0.837	0.209	0.09	97,050	0.824	0.18	0.08	0.889	0.146	0.12
	10-19 hours a week	21,320	0.803	0.235	-0.04	20,423	0.794	0.203	-0.05	0.863	0.171	-0.01
	20-34 hours a week	12,538	0.773	0.264	-0.15	12,232	0.774	0.222	-0.13	0.845	0.192	-0.10
	35-49 hours a week	8,210	0.754	0.284	-0.23	8,034	0.753	0.243	-0.22	0.825	0.212	-0.20
	50+ hours a week	36,440	0.726	0.287	-0.34	34,762	0.729	0.245	-0.33	0.806	0.221	-0.30
IMD band	Least deprived	310,266	0.844	0.221		290,099	0.830	0.202		0.888	0.167	
	Moderately deprived	318,191	0.811	0.254	-0.11	301,369	0.803	0.228	-0.10	0.865	0.195	-0.10
	Most deprived	301,108	0.755	0.305	-0.29	289,699	0.756	0.271	-0.27	0.823	0.241	-0.27

ES – effect size Calculated for those characteristics where there is an obvious preferable state

Table 4: Mean EQ-5D scores for subgroups categorised by presence of long-term health condition or activity limitation

		EQ-5D-3L						EQ-5D-5L (crosswalk)						EQ-5D-5L					Diff 3L 5L
		N	Mean	SD	Diff	ES	rank	N	Mean	SD	Diff	ES	rank	Mean	SD	Diff	ES	rank	
Alzheimer / Dementia	No	841,027	0.798	0.267				798,729	0.791	0.238				0.854	0.207				-0.056
	Yes	5,770	0.459	0.368	-0.339	-1.26	3	5,259	0.425	0.354	-0.366	-1.52	1	0.541	0.312	-0.313	-1.49	3	-0.082
Angina/ Heart	No	787,891	0.808	0.26				747,545	0.8	0.233				0.863	0.2				-0.055
	Yes	58,906	0.621	0.326	-0.187	-0.69	11	56,443	0.628	0.284	-0.172	-0.71	11	0.711	0.272	-0.152	-0.72	11	-0.09
Arthritis/ Joint	No	701,509	0.849	0.224				662,467	0.836	0.205				0.893	0.167				-0.044
	Yes	145,288	0.538	0.319	-0.311	-1.15	7	141,521	0.563	0.267	-0.273	-1.13	8	0.661	0.273	-0.232	-1.1	8	-0.123
Asthma/ Chest	No	755,424	0.807	0.259				715,525	0.8	0.232				0.863	0.199				-0.056
	Yes	91,373	0.695	0.33	-0.112	-0.41	18	88,463	0.697	0.29	-0.103	-0.43	17	0.77	0.268	-0.093	-0.44	16	-0.075
Blind/ Visual	No	835,769	0.799	0.266				793,878	0.792	0.238				0.855	0.207				-0.056
	Yes	11,028	0.518	0.348	-0.281	-1.04	6	10,110	0.522	0.314	-0.27	-1.12	5	0.616	0.293	-0.239	-1.14	5	-0.098
Cancer 5yrs	No	813,143	0.799	0.267				770,084	0.793	0.239				0.856	0.207				-0.057
	Yes	33,654	0.693	0.302	-0.106	-0.39	17	33,904	0.691	0.267	-0.102	-0.42	16	0.772	0.245	-0.084	-0.4	17	-0.079
Deaf/ Hearing	No	804,424	0.804	0.263				762,973	0.797	0.235				0.86	0.203				-0.056
	Yes	42,373	0.624	0.326	-0.18	-0.67	12	41,015	0.629	0.287	-0.168	-0.7	12	0.715	0.271	-0.145	-0.69	12	-0.091
Diabetes	No	771,424	0.807	0.26				728,307	0.8	0.232				0.862	0.2				-0.055
	Yes	75,373	0.673	0.326	-0.134	-0.50	15	75,681	0.678	0.29	-0.122	-0.51	15	0.755	0.269	-0.107	-0.51	14	-0.082
Epilepsy	No	837,428	0.797	0.268				795,728	0.79	0.239				0.854	0.208				-0.057
	Yes	9,369	0.643	0.361	-0.154	-0.57	13	8,260	0.639	0.339	-0.151	-0.63	13	0.721	0.301	-0.133	-0.63	13	-0.078
High blood pressure	No	639,097	0.82	0.254				599,438	0.812	0.229				0.872	0.194				-0.052
	Yes	207,700	0.72	0.3	-0.1	-0.37	19	204,550	0.72	0.262	-0.092	-0.38	19	0.795	0.241	-0.077	-0.37	19	-0.075

		EQ-5D-3L						EQ-5D-5L (crosswalk)						EQ-5D-5L			Diff 3L 5L		
		N	Mean	SD	Diff	ES	rank	N	Mean	SD	Diff	ES	rank	Mean	SD	Diff		ES	rank
Kidney/ Liver	No	831,276	0.799	0.266				788,544	0.792	0.238				0.856	0.206				-0.057
	Yes	15,521	0.571	0.356	-0.228	-0.84	9	15,444	0.583	0.317	-0.209	-0.87	9	0.669	0.301	-0.187	-0.89	9	-0.098
Learning Difficulties	No	839,869	0.797	0.268				797,501	0.79	0.239				0.854	0.208				-0.057
	Yes	6,928	0.567	0.366	-0.230	-0.85	8	6,487	0.557	0.347	-0.233	-0.97	7	0.654	0.31	-0.2	-0.95	7	-0.087
LT Back problem	No	751,489	0.831	0.235				712,604	0.82	0.215				0.879	0.179				-0.048
	Yes	95,308	0.512	0.345	-0.319	-1.18	5	91,384	0.543	0.289	-0.277	-1.15	6	0.641	0.292	-0.238	-1.13	6	-0.129
LT Mental Health	No	815,811	0.807	0.257				772,999	0.799	0.23				0.862	0.199				-0.055
	Yes	30,986	0.475	0.375	-0.332	-1.23	4	30,989	0.514	0.33	-0.285	-1.18	4	0.609	0.308	-0.253	-1.20	4	-0.134
LT Neurological	No	830,573	0.802	0.262				787,774	0.796	0.233				0.859	0.202				-0.057
	Yes	16,224	0.43	0.377	-0.372	-1.38	2	16,214	0.437	0.343	-0.359	-1.49	2	0.54	0.321	-0.319	-1.52	1	-0.11
LT Other	No	738,923	0.814	0.255				695,685	0.806	0.227				0.867	0.195				-0.053
	Yes	107,874	0.668	0.327	-0.146	-0.54	14	108,303	0.672	0.289	-0.134	-0.56	14	0.756	0.266	-0.111	-0.53	15	-0.088
Has comorbidity	No	598,874	0.877	0.19				557,774	0.865	0.173				0.917	0.133				-0.04
	Yes	247,923	0.599	0.326	-0.278	-1.03	10	246,214	0.615	0.28	-0.25	-1.04	10	0.706	0.269	-0.211	-1.00	10	-0.107
No condition	No	536,508	0.714	0.297				518,580	0.716	0.261				0.795	0.236				-0.081
	Yes	310,289	0.936	0.12	0.222	0.82	20	285,408	0.92	0.115	0.204	0.85	20	0.957	0.073	0.162	0.77	20	-0.021
Activities limited due to recent illness or injury	No	741,198	0.85	0.225				699,177	0.837	0.205				0.893	0.17				-0.043
	A little	130,205	0.689	0.263	-0.161	-0.62	18	122,602	0.704	0.216	-0.133	-0.57	18	0.793	0.198	-0.1	-0.5	18	-0.104
	A lot	39,893	0.409	0.386	-0.441	-1.69	1	42,585	0.458	0.335	-0.379	-1.63	3	0.55	0.323	-0.343	-1.71	2	-0.141

ES – effect size [mean difference divided by pooled standard deviation]



Table 5: Matched sample mean EQ-5D scores for subgroups categorised by presence of long-term health condition (matched by age, gender, and presence of comorbidity)

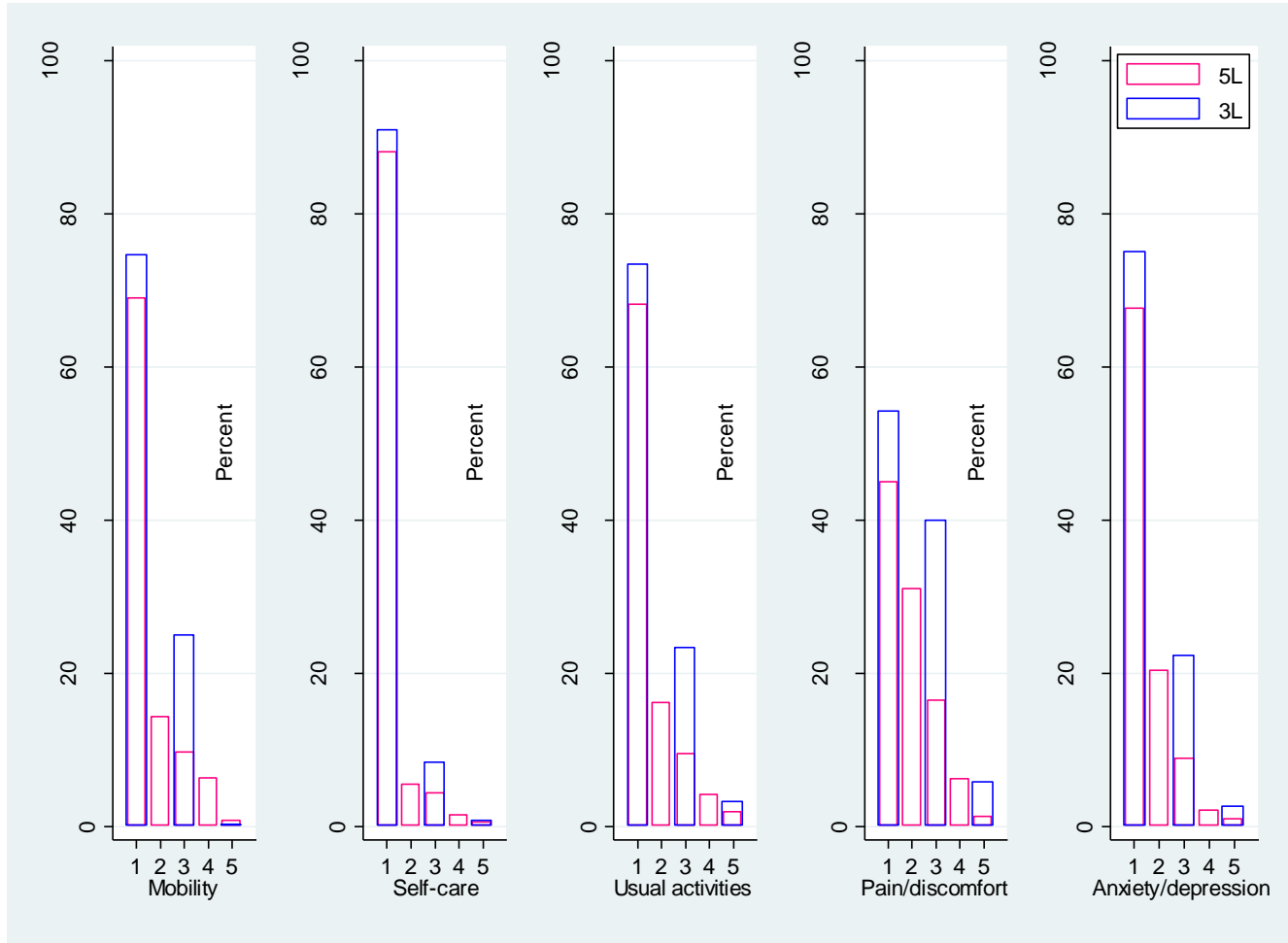
		EQ-5D-3L					EQ-5D-5L (crosswalk)					EQ-5D-5L				Diff 3L 5L
		N	Mean	SD	Diff	ES	N	Mean	SD	Diff	ES	Mean	SD	Diff	ES	
Alzheimer/ Dementia	No	5,537	0.629	0.31			5,109	0.638	0.269			0.725	0.251			-0.096
	Yes	5,537	0.458	0.366	-0.171	-0.49	5,109	0.425	0.352	-0.213	-0.64	0.541	0.311	-0.184	-0.62	-0.083
Angina/ Heart	No	57,340	0.659	0.308			55,414	0.666	0.268			0.751	0.251			-0.092
	Yes	57,340	0.623	0.325	-0.036	-0.11	55,414	0.629	0.283	-0.037	-0.13	0.711	0.271	-0.04	-0.15	-0.088
Arthritis/ Joint	No	124,329	0.735	0.281			122,650	0.731	0.25			0.809	0.221			-0.074
	Yes	124,329	0.543	0.319	-0.192	-0.61	122,650	0.568	0.268	-0.163	-0.60	0.666	0.273	-0.143	-0.55	-0.123
Asthma/ Chest	No	89,277	0.709	0.311			86,993	0.709	0.274			0.786	0.248			-0.077
	Yes	89,277	0.696	0.33	-0.013	-0.04	86,993	0.698	0.29	-0.011	-0.04	0.771	0.267	-0.015	-0.06	-0.075
Blind/ Visual	No	10,647	0.606	0.315			9,835	0.621	0.277			0.710	0.26			-0.104
	Yes	10,647	0.518	0.348	-0.088	-0.26	9,835	0.522	0.314	-0.099	-0.33	0.616	0.293	-0.094	-0.33	-0.098
Cancer 5yrs	No	32,817	0.689	0.308			33,354	0.693	0.266			0.773	0.246			-0.084
	Yes	32,817	0.694	0.301	0.005	0.02	33,354	0.692	0.266	-0.001	0.00	0.773	0.244	0	0.00	-0.079
Deaf/ Hearing	No	41,121	0.638	0.31			40,200	0.642	0.274			0.729	0.258			-0.091
	Yes	41,121	0.625	0.325	-0.013	-0.04	40,200	0.631	0.286	-0.011	-0.04	0.716	0.27	-0.013	-0.05	-0.091
Diabetes	No	73,309	0.667	0.314			74,182	0.676	0.269			0.759	0.252			-0.092
	Yes	73,309	0.674	0.326	0.007	0.02	74,182	0.679	0.289	0.003	0.01	0.756	0.269	-0.003	-0.01	-0.082
Epilepsy	No	9,079	0.7	0.321			8,091	0.704	0.281			0.78	0.256			-0.08
	Yes	9,079	0.645	0.361	-0.055	-0.16	8,091	0.641	0.338	-0.063	-0.20	0.722	0.3	-0.058	-0.21	-0.077
High blood pressure	No	160,377	0.678	0.318			156,042	0.684	0.278			0.766	0.256			-0.088
	Yes	160,377	0.744	0.292	0.066	0.21	156,042	0.742	0.257	0.058	0.22	0.814	0.234	0.048	0.20	-0.07

		EQ-5D-3L					EQ-5D-5L (crosswalk)					EQ-5D-5L					Diff 3L 5L
		N	Mean	SD	Diff	ES	N	Mean	SD	Diff	ES	Mean	SD	Diff	ES		
Kidney/ Liver	No	15,036	0.646	0.324			15,128	0.652	0.28			0.738	0.262			-0.092	
	Yes	15,036	0.573	0.356	-0.073	-0.21	15,128	0.584	0.317	-0.068	-0.23	0.67	0.301	-0.068	-0.24	-0.097	
Learning Difficulties	No	6,711	0.684	0.333			6,321	0.69	0.3			0.767	0.273			-0.083	
	Yes	6,711	0.567	0.366	-0.117	-0.33	6,321	0.558	0.347	-0.132	-0.40	0.654	0.31	-0.113	-0.38	-0.087	
LT Back problem	No	93,046	0.713	0.293			89,915	0.712	0.261			0.791	0.235			-0.078	
	Yes	93,046	0.513	0.344	-0.200	-0.60	89,915	0.544	0.288	-0.168	-0.58	0.642	0.291	-0.149	-0.54	-0.129	
LT Mental Health	No	30,224	0.722	0.309			30,436	0.724	0.27			0.8	0.244			-0.078	
	Yes	30,224	0.476	0.375	-0.246	-0.68	30,436	0.515	0.33	-0.209	-0.66	0.61	0.307	-0.19	-0.65	-0.134	
LT Neurological	No	15,815	0.687	0.317			15,925	0.693	0.275			0.774	0.252			-0.087	
	Yes	15,815	0.431	0.377	-0.256	-0.69	15,925	0.438	0.342	-0.255	-0.76	0.541	0.321	-0.233	-0.75	-0.11	
LT Other	No	105,822	0.719	0.308			106,884	0.719	0.268			0.795	0.243			-0.076	
	Yes	105,822	0.669	0.327	-0.050	-0.16	106,884	0.673	0.289	-0.046	-0.16	0.757	0.266	-0.038	-0.15	-0.088	

ES – effect size [mean difference divided by pooled standard deviation]

NB: Matching results in smaller samples for those with conditions as not everyone with a condition is matched

Figure 1: Distribution across EQ-5D-3L and 5L dimensions



3L: level 2 'some problems' level 3 'unable/extreme'

5L: level 2 'slight problems' level 3 'moderate' level 4 'severe' level 5 'unable/extreme'

## APPENDIX

Appendix Table 1: Distribution across EQ-5D dimension levels

	Mobility		Self-care		Usual activities		Pain/discomfort		Anxiety/depression	
	N	%	N	%	N	%	N	%	N	%
<b>EQ-5D-3L</b>										
Level 1	705,624	72.5	850,148	87.0	695,470	71.4	518,070	53.0	703,244	70.6
Level 2	221,845	22.8	73,260	7.5	206,020	21.1	360,745	36.9	203,163	20.4
Level 3	2,731	0.3	6,792	0.7	28,710	2.9	51,385	5.3	23,793	2.4
Missing	43,233	4.4	46,817	4.8	44,060	4.5	47,843	4.9	66,001	6.6
<b>EQ-5D-5L</b>										
Level 1	620,617	67.4	782,047	84.6	614,584	66.7	410,313	44.5	602,674	64.3
Level 2	121,643	13.2	45,933	5.0	136,870	14.8	270,172	29.3	177,155	18.9
Level 3	80,823	8.8	36,115	3.9	79,310	8.6	138,650	15.0	75,835	8.1
Level 4	52,297	5.7	12,431	1.3	34,943	3.8	51,544	5.6	17,879	1.9
Level 5	6,430	0.7	5,284	0.6	16,103	1.7	11,131	1.2	8,267	0.9
Missing	38,323	4.2	42,697	4.6	40,139	4.4	40,371	4.4	55,431	5.9

Appendix Table 2: Distribution across EQ-5D dimension levels by condition

	Level	Mobility				Self-care				Usual Activities				Pain/ discomfort				Anxiety/ depression			
		N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%		
Alzheimer	1	1,794	31.1	1,204	22.9	2,480	43	1,810	34.4	1,332	23.1	814	15.5	1,933	33.5	1,274	24.2	2,505	43.4	1,618	30.8
Dementia	2	3,666	63.5	919	17.5	2,209	38.3	860	16.4	2,434	42.2	813	15.5	3,253	56.4	1,501	28.5	2,720	47.1	1,569	29.8
	3	310	5.4	1,226	23.3	1,081	18.7	1,068	20.3	2,004	34.7	1,192	22.7	584	10.1	1,631	31	545	9.4	1,410	26.8
	4			1,414	26.9			639	12.2			925	17.6			645	12.3			426	8.1
	5			496	9.4			882	16.8			1,515	28.8			208	4			236	4.5
			5,770		5,259																
Angina	1	23,638	40.1	18,955	33.6	44,513	75.6	39,328	69.7	24,942	42.3	19,761	35	15,618	26.5	11,526	20.4	37,187	63.1	30,819	54.6
Heart	2	34,942	59.3	12,464	22.1	13,317	22.6	7,239	12.8	28,371	48.2	14,213	25.2	34,899	59.2	17,787	31.5	19,509	33.1	14,908	26.4
	3	326	0.6	13,306	23.6	1,076	1.8	6,757	12	5,593	9.5	12,829	22.7	8,389	14.2	16,905	30	2,210	3.8	8,266	14.6
	4			10,903	19.3			2,373	4.2			6,491	11.5			8,424	14.9			1,762	3.1
	5			815	1.4			746	1.3			3,149	5.6			1,801	3.2			688	1.2
		58,906		56,443																	

	Level	Mobility				Self-care				Usual Activities				Pain/ discomfort				Anxiety/ depression			
		N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Arthritis	1	44,441	30.6	32,481	23	105,727	72.8	92,588	65.4	49,718	34.2	38,170	27	8,698	6	4,648	3.3	88,366	60.8	74,012	52.3
Joint	2	100,104	68.9	38,689	27.3	37,089	25.5	21,467	15.2	82,836	57	42,065	29.7	105,974	72.9	43,260	30.6	50,242	34.6	37,785	26.7
	3	743	0.5	38,127	26.9	2,472	1.7	19,144	13.5	12,734	8.8	36,090	25.5	30,616	21.1	57,369	40.5	6,680	4.6	22,010	15.6
	4			30,187	21.3			6,654	4.7			18,347	13			29,796	21.1			5,451	3.9
	5			2,037	1.4			1,668	1.2			6,849	4.8			6,448	4.6			2,263	1.6
		145,288		141,521																	
Asthma	1	54,035	59.1	46,993	53.1	75,284	82.4	68,961	78	52,705	57.7	45,896	51.9	37,714	41.3	29,709	33.6	59,919	65.6	51,015	57.7
Chest	2	36,969	40.5	15,137	17.1	14,991	16.4	8,088	9.1	32,737	35.8	17,691	20	42,877	46.9	25,689	29	27,011	29.6	20,757	23.5
	3	369	0.4	13,902	15.7	1,098	1.2	7,778	8.8	5,931	6.5	13,953	15.8	10,782	11.8	20,023	22.6	4,443	4.9	11,696	13.2
	4			11,571	13.1			2,912	3.3			7,846	8.9			10,384	11.7			3,360	3.8
	5			860	1			724	0.8			3,077	3.5			2,658	3			1,635	1.8
		91,373		88,463																	
Blind	1	2,922	26.5	2,098	20.8	6,628	60.1	5,378	53.2	2,744	24.9	1,971	19.5	2,607	23.6	1,823	18	5,843	53	4,488	44.4
Visual	2	7,885	71.5	2,087	20.6	3,714	33.7	1,776	17.6	6,159	55.8	2,263	22.4	6,596	59.8	2,674	26.4	4,479	40.6	2,889	28.6
	3	221	2	2,732	27	686	6.2	1,729	17.1	2,125	19.3	2,901	28.7	1,825	16.5	3,430	33.9	706	6.4	1,970	19.5
	4			2,736	27.1			761	7.5			1,751	17.3			1,710	16.9			497	4.9
	5			457	4.5			466	4.6			1,224	12.1			473	4.7			266	2.6
		11,028		10,110																	
Cancer 5yrs	1	18,736	55.7	16,532	48.8	27,515	81.8	26,145	77.1	17,950	53.3	15,686	46.3	11,899	35.4	9,249	27.3	22,357	66.4	19,549	57.7
	2	14,736	43.8	6,701	19.8	5,674	16.9	3,525	10.4	13,222	39.3	7,886	23.3	18,606	55.3	11,897	35.1	10,337	30.7	9,030	26.6
	3	182	0.5	6,059	17.9	465	1.4	2,924	8.6	2,482	7.4	6,163	18.2	3,149	9.4	8,653	25.5	960	2.9	4,224	12.5
	4			4,190	12.4			978	2.9			2,679	7.9			3,346	9.9			776	2.3
	5			422	1.2			332	1			1,490	4.4			759	2.2			325	1
		33,654		33,904																	
Deaf	1	17,796	42	14,608	35.6	31,840	75.1	28,645	69.8	18,893	44.6	15,521	37.8	11,534	27.2	8,503	20.7	26,656	62.9	22,501	54.9
Hearing	2	24,304	57.4	8,729	21.3	9,506	22.4	5,139	12.5	19,203	45.3	9,685	23.6	25,158	59.4	13,094	31.9	14,041	33.1	10,674	26
	3	273	0.6	9,135	22.3	1,027	2.4	4,816	11.7	4,277	10.1	8,843	21.6	5,681	13.4	12,373	30.2	1,676	4	5,997	14.6
	4			7,734	18.9			1,672	4.1			4,499	11			5,828	14.2			1,295	3.2
	5			809	2			743	1.8			2,467	6			1,217	3			548	1.3
		42,373		41,015																	

	Level	Mobility				Self-care				Usual Activities				Pain/ discomfort				Anxiety/ depression			
		N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Diabetes	1	38,303	50.8	34,062	45	60,282	80	57,032	75.4	40,770	54.1	36,847	48.7	26,812	35.6	21,905	28.9	50,704	67.3	45,419	60
	2	36,589	48.5	15,335	20.3	13,800	18.3	7,845	10.4	29,152	38.7	16,022	21.2	39,317	52.2	23,522	31.1	21,776	28.9	17,483	23.1
	3	481	0.6	13,514	17.9	1,291	1.7	7,077	9.4	5,451	7.2	12,782	16.9	9,244	12.3	18,488	24.4	2,893	3.8	9,325	12.3
	4			11,591	15.3			2,743	3.6			6,859	9.1			9,513	12.6			2,423	3.2
	5			1,179	1.6			984	1.3			3,171	4.2			2,253	3			1,031	1.4
		75,373		75,681																	
Epilepsy	1	5,092	54.3	4,026	48.7	6,873	73.4	5,630	68.2	4,781	51	3,765	45.6	4,056	43.3	3,072	37.2	5,476	58.4	4,125	49.9
	2	4,126	44	1,435	17.4	2,076	22.2	920	11.1	3,636	38.8	1,549	18.8	4,162	44.4	2,073	25.1	3,142	33.5	1,964	23.8
	3	151	1.6	1,334	16.2	420	4.5	925	11.2	952	10.2	1,489	18	1,151	12.3	1,828	22.1	751	8	1,361	16.5
	4			1,152	13.9			434	5.3			893	10.8			956	11.6			507	6.1
	5			313	3.8			351	4.2			564	6.8			331	4			303	3.7
		9,369		8,260																	
High blood pressure	1	122,288	58.9	105,842	51.7	177,472	85.4	166,400	81.3	126,968	61.1	111,327	54.4	81,505	39.2	63,969	31.3	146,005	70.3	129,048	63.1
	2	84,740	40.8	41,270	20.2	28,144	13.6	17,051	8.3	70,328	33.9	43,432	21.2	106,311	51.2	68,361	33.4	55,763	26.8	46,946	23
	3	672	0.3	32,519	15.9	2,084	1	14,679	7.2	10,404	5	30,145	14.7	19,884	9.6	47,646	23.3	5,932	2.9	21,738	10.6
	4			22,991	11.2			4,933	2.4			13,816	6.8			20,326	9.9			4,815	2.4
	5			1,928	0.9			1,487	0.7			5,830	2.9			4,248	2.1			2,003	1
		207,700		204,550																	
Kidney Liver	1	6,338	40.8	5,426	35.1	10,925	70.4	10,018	64.9	6,313	40.7	5,383	34.9	3,766	24.3	2,918	18.9	8,708	56.1	7,480	48.4
	2	9,032	58.2	2,977	19.3	4,157	26.8	2,107	13.6	7,332	47.2	3,373	21.8	8,973	57.8	4,399	28.5	5,727	36.9	4,060	26.3
	3	151	1	3,248	21	439	2.8	2,127	13.8	1,876	12.1	3,374	21.8	2,782	17.9	4,671	30.2	1,086	7	2,598	16.8
	4			3,422	22.2			881	5.7			2,188	14.2			2,699	17.5			854	5.5
	5			371	2.4			311	2			1,126	7.3			757	4.9			452	2.9
		15,521		15,444																	
Learning Diff	1	3,535	51	2,882	44.4	4,044	58.4	3,458	53.3	2,687	38.8	2,327	35.9	3,116	45	2,443	37.7	3,134	45.2	2,360	36.4
	2	3,260	47.1	1,205	18.6	2,295	33.1	1,041	16	3,401	49.1	1,327	20.5	2,918	42.1	1,553	23.9	2,816	40.6	1,627	25.1
	3	133	1.9	1,101	17	589	8.5	989	15.2	840	12.1	1,424	22	894	12.9	1,343	20.7	978	14.1	1,337	20.6
	4			987	15.2			534	8.2			908	14			841	13			673	10.4
	5			312	4.8			465	7.2			501	7.7			307	4.7			490	7.6
		6,928		6,487																	

	Level	Mobility				Self-care				Usual Activities				Pain/ discomfort				Anxiety/ depression			
		N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
LT Back problem	1	35,954	37.7	27,463	30.1	69,115	72.5	59,339	64.9	32,521	34.1	24,909	27.3	6,444	6.8	3,549	3.9	53,226	55.8	42,925	47
	2	58,871	61.8	21,543	23.6	24,817	26	13,505	14.8	54,096	56.8	26,175	28.6	64,027	67.2	24,700	27	35,753	37.5	24,758	27.1
	3	483	0.5	21,502	23.5	1,376	1.4	12,734	13.9	8,691	9.1	22,672	24.8	24,837	26.1	34,540	37.8	6,329	6.6	16,488	18
	4			19,730	21.6			4,889	5.3			13,139	14.4			22,734	24.9			4,979	5.4
	5			1,146	1.3			917	1			4,489	4.9			5,861	6.4			2,234	2.4
		95,308		91,384																	
LT Mental Health	1	17,070	55.1	15,505	50	22,053	71.2	20,479	66.1	11,922	38.5	10,666	34.4	11,697	37.7	9,667	31.2	3,924	12.7	2,833	9.1
	2	13,681	44.2	5,520	17.8	8,189	26.4	4,134	13.3	15,736	50.8	7,059	22.8	13,904	44.9	7,419	23.9	16,629	53.7	6,156	19.9
	3	235	0.8	5,151	16.6	744	2.4	3,989	12.9	3,328	10.7	6,966	22.5	5,385	17.4	7,221	23.3	10,433	33.7	10,629	34.3
	4			4,368	14.1			1,854	6			4,565	14.7			4,949	16			6,997	22.6
	5			445	1.4			533	1.7			1,733	5.6			1,733	5.6			4,374	14.1
		30,986		30,989																	
LT Neurological	1	4,560	28.1	3,725	23	8,951	55.2	7,634	47.1	3,816	23.5	3,015	18.6	2,439	15	1,828	11.3	6,980	43	5,526	34.1
	2	11,132	68.6	2,679	16.5	6,330	39	2,840	17.5	9,417	58	3,371	20.8	9,274	57.2	3,484	21.5	7,456	46	4,554	28.1
	3	532	3.3	3,809	23.5	943	5.8	3,304	20.4	2,991	18.4	4,403	27.2	4,511	27.8	5,392	33.3	1,788	11	3,961	24.4
	4			4,809	29.7			1,601	9.9			3,599	22.2			3,903	24.1			1,366	8.4
	5			1,192	7.4			835	5.1			1,826	11.3			1,607	9.9			807	5
		16,224		16,214																	
LT Other	1	64,472	59.8	58,209	53.7	88,373	81.9	84,365	77.9	59,276	54.9	53,230	49.1	35,788	33.2	27,428	25.3	67,442	62.5	58,905	54.4
	2	42,590	39.5	19,041	17.6	17,597	16.3	9,692	8.9	41,125	38.1	23,957	22.1	58,613	54.3	36,626	33.8	34,821	32.3	27,445	25.3
	3	812	0.8	15,581	14.4	1,904	1.8	8,998	8.3	7,473	6.9	17,208	15.9	13,473	12.5	27,557	25.4	5,611	5.2	15,477	14.3
	4			13,418	12.4			3,740	3.5			9,560	8.8			12,973	12			4,327	4
	5			2,054	1.9			1,508	1.4			4,348	4			3,719	3.4			2,149	2
		107,874		108,303																	
No condition	1	299,319	96.5	268,217	94	308,923	99.6	283,211	99.2	296,855	95.7	266,962	93.5	251,641	81.1	201,849	70.7	270,519	87.2	231,190	81
	2	10,768	3.5	13,591	4.8	1,223	0.4	1,399	0.5	12,742	4.1	14,973	5.2	57,634	18.6	71,821	25.2	38,384	12.4	42,451	14.9
	3	202	0.1	2,650	0.9	143	0.045	454	0.2	692	0.2	2,529	0.9	1,014	0.3	10,346	3.6	1,386	0.4	10,245	3.6
	4			574	0.2			115	0.04			481	0.2			1,209	0.4			1,144	0.4
	5			376	0.1			229	0.1			463	0.2			183	0.1			378	0.1
		310,289		285,408																	

Appendix Table 3: Proportion at ceiling and floor by condition

	n	%	n	%
11111				
Alzheimer/ Dementia	611	10.6	334	6.4
Angina /Heart problems	10,429	17.7	7,121	12.6
Arthritis/ Joint problems	5,957	4.1	2,940	2.1
Asthma/ Chest problems	28,610	31.3	21,101	23.9
Blind /Visual problems	1,051	9.5	638	6.3
Cancer 5yrs	8,541	25.4	6,209	18.3
Deaf/ Hearing problems	7,759	18.3	5,257	12.8
Diabetes	20,052	26.6	15,618	20.6
Epilepsy	2,637	28.1	1,836	22.2
High blood pressure	63,971	30.8	47,320	23.1
Kidney or Liver problems	2,531	16.3	1,830	11.8
Learning difficulties	1,139	16.4	792	12.2
Long-term back problems	4,808	5.0	2,417	2.6
Long-term mental health	1,948	6.3	1,295	4.2
Long-term neurological problems	1,045	6.4	658	4.1
Long-term other health problems	25,749	23.9	18,202	16.8
33333/55555				
Alzheimer/ Dementia	24	0.42	29	0.55
Angina /Heart problems	36	0.06	31	0.05
Arthritis/ Joint problems	91	0.06	75	0.05
Asthma/ Chest problems	49	0.05	42	0.05
Blind /Visual problems	26	0.24	17	0.17
Cancer 5yrs	20	0.06	19	0.06
Deaf/ Hearing problems	33	0.08	23	0.06
Diabetes	40	0.05	40	0.05
Epilepsy	18	0.19	14	0.17
High blood pressure	73	0.04	59	0.03
Kidney or Liver problems	22	0.14	19	0.12
Learning difficulties	15	0.22	10	0.15
Long-term back problems	87	0.09	80	0.09
Long-term mental health	60	0.19	48	0.15
Long-term neurological problems	63	0.39	48	0.30
Long-term other health problems	96	0.09	50	0.05



Appendix Table 4: Shannon's indices for EQ-5D dimensions by condition

Shannon's indices	Mobility				Self-care				Usual activities				Pain/ Discomfort				Anxiety/ Depression			
	3L E	3L H	5L E	5L H	3L E	3L H	5L E	5L H	3L E	3L H	5L E	5L H	3L E	3L H	5L E	5L H	3L E	3L H	5L E	5L H
Alzheimer/ Dementia	0.74	0.81	0.97	1.56	0.95	1.04	0.96	1.54	0.97	1.07	0.98	1.58	0.84	0.92	0.90	1.45	0.85	0.94	0.88	1.42
Angina /Heart problems	0.64	0.71	0.88	1.42	0.56	0.62	0.60	0.96	0.86	0.94	0.91	1.46	0.86	0.94	0.90	1.44	0.71	0.78	0.70	1.12
Arthritis/ Joint problems	0.59	0.65	0.89	1.43	0.59	0.65	0.64	1.03	0.82	0.90	0.92	1.47	0.66	0.73	0.81	1.31	0.74	0.81	0.73	1.17
Asthma/ Chest problems	0.64	0.70	0.77	1.24	0.46	0.51	0.48	0.78	0.79	0.86	0.80	1.29	0.89	0.97	0.88	1.42	0.71	0.78	0.70	1.12
Blind /Visual problems	0.61	0.67	0.93	1.50	0.77	0.84	0.79	1.28	0.90	0.99	0.98	1.57	0.86	0.95	0.91	1.47	0.80	0.88	0.80	1.28
Cancer 5yrs	0.65	0.71	0.80	1.29	0.48	0.52	0.49	0.80	0.81	0.90	0.84	1.34	0.84	0.92	0.86	1.38	0.67	0.74	0.66	1.06
Deaf/ Hearing problems	0.65	0.71	0.89	1.42	0.58	0.64	0.60	0.97	0.87	0.95	0.90	1.45	0.85	0.93	0.89	1.43	0.72	0.79	0.70	1.13
Diabetes	0.66	0.73	0.84	1.34	0.51	0.56	0.53	0.85	0.81	0.89	0.83	1.33	0.88	0.96	0.89	1.43	0.68	0.75	0.67	1.07
Epilepsy	0.69	0.76	0.84	1.35	0.64	0.70	0.65	1.04	0.86	0.94	0.87	1.40	0.89	0.98	0.89	1.43	0.80	0.88	0.79	1.28
High blood pressure	0.63	0.69	0.77	1.24	0.41	0.45	0.43	0.69	0.74	0.82	0.76	1.23	0.85	0.93	0.86	1.38	0.64	0.70	0.62	1.00
Kidney or Liver problems	0.66	0.73	0.89	1.44	0.64	0.70	0.66	1.07	0.89	0.98	0.93	1.50	0.88	0.97	0.92	1.49	0.80	0.88	0.79	1.26
Learning difficulties	0.70	0.77	0.87	1.41	0.81	0.89	0.81	1.31	0.88	0.97	0.93	1.50	0.90	0.99	0.90	1.44	0.91	1.00	0.91	1.47
Long-term back problems	0.63	0.69	0.89	1.43	0.59	0.64	0.65	1.04	0.82	0.91	0.92	1.49	0.73	0.80	0.85	1.37	0.79	0.87	0.79	1.26
Long-term mental health	0.66	0.73	0.80	1.29	0.62	0.68	0.65	1.04	0.87	0.95	0.92	1.48	0.94	1.03	0.93	1.50	0.88	0.96	0.94	1.52
Long-term neurological problems	0.66	0.73	0.95	1.53	0.78	0.86	0.85	1.36	0.88	0.97	0.98	1.57	0.87	0.96	0.94	1.51	0.88	0.96	0.89	1.43
Long-term other health problems	0.65	0.71	0.78	1.25	0.48	0.53	0.49	0.79	0.80	0.88	0.82	1.32	0.87	0.96	0.89	1.43	0.74	0.81	0.72	1.16
No condition	0.14	0.16	0.17	0.27	0.03	0.03	0.04	0.06	0.17	0.19	0.18	0.28	0.46	0.50	0.46	0.74	0.36	0.40	0.37	0.60
Mean	0.61	0.72	0.86	1.38	0.57	0.67	0.64	1.03	0.79	0.93	0.89	1.44	0.80	0.93	0.89	1.43	0.72	0.84	0.77	1.24
Min	0.00	0.65	0.77	1.24	0.00	0.45	0.43	0.69	0.00	0.82	0.76	1.23	0.00	0.73	0.81	1.31	0.00	0.70	0.62	1.00
Max	0.74	0.81	0.97	1.56	0.95	1.04	0.96	1.54	0.97	1.07	0.98	1.58	0.94	1.03	0.94	1.51	0.91	1.00	0.94	1.52